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IS THE GILA MONSTER A POISONOUS REPTILE ?

By F. H. SNOW, University of Kansas, Lawrence.

IN the desert regions of southern Arizona, southern California, and Sonora, Mexico, a common reptile is the so-called Gila monster, the *Heloderma suspectum* of Cope. Three summers spent in the work of the University of Kansas collecting expeditions to southern Arizona have brought the writer of this paper into somewhat familiar relations with this creature, in regard to whose real character there has been so great a diversity of opinion among non-residents of its natural habitat. In 1886 I had a healthy specimen of the monster sent to me from Arizona by a former student. This specimen I kept in confinement at the University for three years, during which time it subsisted upon a diet of raw eggs. In order to determine whether it was venomous or not I allowed it to bite young kittens, which exhibited no symptoms of having been poisoned, the only effect of the bite being a slight swelling due to the mechanical pressure exerted by the prolonged closing of the powerful jaws of the reptile upon the part attacked.

During the past summer, on July 26, 1906, I had the fortune to be bitten on the ball of the right thumb by a Gila monster, one of a pair which had been captured some two weeks previously and kept in a large box awaiting our departure from camp upon our homeward journey. In the same box were also placed two specimens of a very large frog. Late one afternoon it was observed that one of the frogs had been bitten by one of the Gila monsters. The next morning the bitten frog was dead and its body had shrunken to half its former dimensions. This was the first indication I had observed suggesting that the *Heloderma* might be venomous.

When we broke camp the two Gila monsters were placed in a galvanized-iron water-bucket, over the top of which a towel was tied to prevent the escape of the reptiles. I sat upon the seat with the driver with this bucket in front of me between my feet. The motion of the wagon apparently disturbing the serenity of the reptiles, they soon began to attempt an escape by pushing their heads against the towel. Being fearful that they would accomplish their purpose, whenever the prominence caused by the upward pressure indicated the location of the head of one of the monsters, I would force it down by a rap with the handle of the driver's whip,

or with my spectacle case. At last, becoming a little careless, I used my hand instead of the artificial tools. In one of these careless movements I was struck in the ball of the right thumb by one of the indignant reptiles, receiving six incisions, four of which were of considerable depth, from which the blood flowed in considerable quantities. Fortunately the jaws did not close upon the thumb so that there was no crushing effect produced. I sucked the blood from the wounds until one of my associates, Mr. L. A. Adams, who had some years ago suffered severely from a rattlesnake bite, provided me with a vial of permanganate of potash, which was kept in contact with the wounds for about an hour. No evidence whatever of poisonous effect from this bite was to be detected, and I began to doubt the venomous character of the reptiles, since, notwithstanding the prompt application of the proper remedies, it seemed inevitable that at least some faint trace of the poison should have been left. But unless the Gila monster were in fact a venomous reptile, how could its universal bad reputation be accounted for? I think I may say that, without a single exception, the residents of Arizona and Sonora believe the bite of the *Heloderma* to be a very dangerous infliction, and several instances were circumstantially related to me of ranchmen and cowboys who had suffered untold agonies and had narrowly escaped death after one of its vicious attacks.

Since my return from the expedition which gave me this unusual experience I have been looking up the literature of the subject, and have had correspondence with some high authorities. Dr. S. Weir Mitchell, of Philadelphia, writes as follows: "This beast bites and lets go, and there is no result. The poison acts when it *chews* on the animal it bites." An article by Doctor Mitchell and Dr. Edward T. Reichert in the *Medical News* (vol. XLII, p. 209) gives the results of careful experiments by injecting the saliva of the Gila monster into pigeons, rabbits, and frogs. The following conclusions are reached:

"That the poison of *Heloderma* causes no local injury. That it arrests the heart in diastole and that the organ afterwards contracts slowly—possibly in rapid *vigor mortis*.

"That the cardiac muscle loses its irritability to stimulate at the time it ceases to beat.

"That the other muscles and the nerves respond readily to irritants.

"That the spinal cord has its power annihilated abruptly and refuses to respond to the most powerful electrical currents."

This article goes on to state that "there remains in our minds no doubt as to the fact that the saliva which drops from the mouth of *Heloderma* when it bites is a very active poison. The briefest examination of the lizard's anatomy shows why it has been with reason suspected to be poisonous and why it poisons with so much difficulty. Unless the teeth are entire, the poison abundant, and the teeth buried in the bitten flesh so as to force it down into contact with the ducts, where they open at the crown of the teeth, it is hard to see how even a drop of the poison could be forced into the wounds. Yet it is certain that small animals may die from the bite, and this may be due to the extraordinary activity of the poison and to the lizard's habit of tenaciously holding fast to what it bites, so as to allow time for a certain amount of absorption."

The latest contribution to the literature of the subject is from the pen of George Wharton James, of Pasadena, Cal., who writes as follows: "Many people will tell you that the *Heloderma* has no poison glands, and that therefore its bite cannot be dangerous. This is a most dangerous illusion. The venom of the *Heloderma* is as poisonous as that of the rattlesnake, as several people who have been bitten have found out to their cost. For many years I have been investigating this subject, and I will make quite clear why some people are bitten by the *Heloderma* without injury and others suffer severely. The venom-glands are situated under the chin, thus being on the lower jaw instead of the upper, as in the case of the rattlesnake. They are modified from glands which correspond to the sublingual glands of mammals. There are four ducts leading out of each gland. These ducts perforate the lower jaw and open in front of the grooved teeth.

"A careful study of the dentition of the *Heloderma* shows that there are several intermediate forms between the unmodified teeth of the reptile and the fully developed poison-fangs. The poison-glands are compound tubular glands, closely resembling the other salivary glands in structure. The peculiarity of their secretion is to be explained by their physiological activity rather than by their structure. So writes my friend, Dr. C. A. Whiting, of the Pacific College of Osteopathy, who has given some time to the study of the teeth and glands of the *Heloderma*. Though their poison teeth are grooved, there is no connection between the poison-glands and the teeth, as in the case of the duct of the rattlesnake. The poison pours out onto the floor of the mouth, between the lips and the gums; that is, into the interior of the bottom jaw. Being below the teeth and not directly communicated to them, the poison

sometimes fails to find its way into a wound. The saliva of the upper jaw is perfectly harmless, as is also the same saliva in the lower jaw; but it must not be forgotten that there is also a deadly venom in the lower jaw, which gets mixed with the saliva.

"As a rule, the Gila monster is lazy and sluggish, and one might play with him for hours and keep him as a pet for years and never see any sign of anger; but let him be angered and then he is dangerous, and the real danger comes when, as he bites, he turns over. With a vicious lunge he seizes the object and at the same moment turns over with lightning-like rapidity. He can hold on with the tenacity of a bulldog, or he can bite so quickly that he snips a piece of flesh out easier than one would pinch off a piece of a cracker. I have seen this action a hundred times, and this is what one must beware of. When the reptile thus bites, holds on, and turns over, the danger of the case is as great as the most dangerous bite of a rattlesnake, for, in this position, if the poison-glands are active, the saliva and poison commingle and flow freely into the teeth, and thus into the wound."